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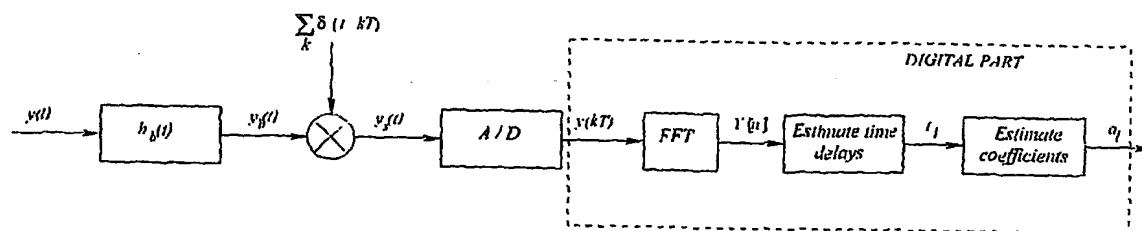
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(54) Title: SYNCHRONIZATION AND CHANNEL ESTIMATION WITH SUB-NYQUIST SAMPLING IN ULTRA-WIDE-  
BAND COMMUNICATION SYSTEMS



(57) Abstract: The system and method for estimating impulse response of a wideband communication channel represented as linear combination of L time-shifted pulsed  $P_1(t)$  with propagation coefficients  $a_l$ , comprising functionalities or steps for obtaining an ultrawideband signal  $y(t)$  of Fig. 1) received over the channel, filtered ( $h_{(1)}$  of Fig. 1) with low pass/bandpass filter and sampled uniformly at a sub-Nyquist rate; a functionality for determining discrete-Fourier-transform coefficients  $Y_j$  and  $S_j$  (FFT of Figure 1) from the sampled received signal and a transmitted ultra-wide-band pulse, respectively; a functionality for determining dominant singular vectors of a matrix having  $Y_{j+i4} / S_{j+i4}$ , as its  $i, j$ -elements; a functionality for determining dominant signal poles from the dominant singular vectors and determining the times shifts from the estimated powers; and a functionality for determining the propagation coefficients from a system of linear equalizations.

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